PROGRESS REPORT 137

PENNSYLVANIA GEOLOGICAL SURVEY

FOURTH SERIES

PRELIMINARY REPORT

GEOLOGY AND MINERAL RESOURCES OF NEW FLORENCE QUADRANGLE PENNSYLVANIA

By

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INTRODUCTION

The New Florence quadrangle, in southwestern Pennsylvania, includes an area of approximately 227 square miles, extending from latitude north 40°15' to 40°30' and from longitude west 79°00' to 79°15'. It occupies parts of southern Indiana, eastern Westmoreland, southern Cambria, and northwestern Somerset counties.

Laurel Hill and Chestnut Ridge, north-east trending anticlinal ridges, dominate the topography of the New Florence quadrangle. Between these ridges is the broad, undulating, scenic Ligonier Valley. Blacklick Creek and the Conemaugh River, principal streams of the area, flow westward, cutting steep V-shaped valleys across Laurel Hill and Chestnut Ridge. The course of the Conemaugh River has afforded a natural route for the main line of the Pennsylvania Railroad.

Geologic field work, carried on in the area during the summer field seasons of 1947 - 1950, is essentially complete, except for the field checking of certain critical points, and the obtaining of mine survey maps and core drill records. The accumulated data will be published as a detailed report on the geology and mineral resources. The map, the most important feature of the present report, is accompanied by a brief text and is intended as an interim report on the progress of the New Florence project.

The author is grateful to the mining companies and individuals who cooperated by supplying data essential to an appraisal of the mineral resources.

STRUCTURE

The rocks in the New Florence quadrangle are folded into alternating high arches, anticlines, and deep basins, synclines. These structures, roughly parallel, trend northeastward and are reflected in the topography, the anticlines forming the mountains and the synclines forming the valleys.

The drainage pattern of the area appears to be influenced locally by structure. The Conemaugh River follows a meandering course across the quadrangle, and bends of the river locally conform roughly to the structure contours as is strikingly apparent at New Florence.

Chestnut Ridge anticline, one of the more prominent geologic structures in western Pennsylvania, may be traced from West Virginia northeastward across Fayette, Westmoreland, and Indiana counties. From an elongated domal high at the head of Snyders Run along the west-central margin of the quadrangle, the structure plunges northeastward to the north-central boundary without interruption. The anticline is slightly asymmetrical, the eastern flank being the shorter. The dip of the limbs is normally 10 to 12 degrees, but south of the Conemaugh River the east flank is interrupted by a strike fault, and dips up to 70 degrees were observed.

Laurel Hill anticline, likewise a prominent structure, crosses the southeastern corner of the quadrangle. In this area, the fold is more symmetrical and its axial trend more straight than Chestnut Ridge. There are two elongated structural highs on the Laurel Hill anticline within the quadrangle.

Ligonier syncline, between Chestnut Ridge and Laurel Hill anticlines, is a broad, irregularly-shaped structural and topographic basin. From the eastern margin of the quadrangle near Seward, the sinuous axis of the syncline plunges to the southwest into a structural basin with its center at Old Colony, Ligonier Township.

The southwest-plunging axis of the Latrobe syncline crosses the northwest corner of the quadrangle. Along the northeast margin of the quadrangle, the Nolo anticline plunges to the southwest and loses its identity just east of Seanor. Between the Nolo and Chestnut Ridge anticlines is the Brush Valley syncline, which plunges to the north.

Faulting

Evidence of minor faulting may be observed at several places within the New Florence quadrangle. At the surface, the magnitude of the faulting is apparently not great, but it may increase with depth (Fettke, 1951).

The strongest indication of faulting is on the east flank of Chestnut Ridge, south of the Conemaugh River, where massive Pottsville sandstone, dipping 50 to 70 degrees to the southeast, forms a conspicuous hogback parallel to the strike of the ridge. This fault may be traced continuously to the western boundary of the quadrangle, but dies out quite abruptly to the north near the river. The actual fault surface was not observed, but displacement probably does not exceed 25 feet.

Three east-dipping thrust faults of small displacement, noted in cuts on the main line of the Pennsylvania Railroad in the Conemaugh gorge through Chestnut Ridge, probably result from local adjustment. A probable tear fault is indicated on the east side of Laurel Hill, south of route 271. This fault is inferred from the difficulty in matching the structure contour lines and from abnormally steep dips observed to the south in the Somerset quadrangle.

SURFACE ROCKS

The exposed rocks in the New Florence quadrangle are approximately 2380 feet thick and are of Pennsylvanian and Mississippian age. An additional 5500 feet of unexposed or subsurface rocks have been penetrated in exploratory wells drilled for natural gas. All of the rocks are of sedimentary origin and consist predominately of stratified shale and sandstone with interbedded coal, clay, and limestone. All of the rocks show lateral and vertical gradations. The generalized columnar section accompanying the geologic map was compiled from measured sections and core drill records. It shows the relative positions of and the average intervals between the prominent members.

Unconsolidated silt, sand, and gravel of recent origin occupy aggraded flood plains of the principal streams.

Pennsylvanian System

Monongahela Group, Cm

The Monongahela group has been removed by erosion everywhere in the quadrangle except in the deeper parts of the Latrobe and Ligonier synclines where remnants of the lower part of the group cap the hilltops. In the center of the Ligonier syncline, the group has an eroded thickness of about 220 feet, in which the following members can be recognized: Fishpot limestone, Redstone coal, and Pittsburgh coal. The bottom of the Pittsburgh coal marks the base of the Monongahela group.

The Pittsburgh coal is remarkable for its wide distribution, quality, thickness (generally 6 to 8 feet), and uniformity. As a result it has been the most productive of the bituminous coal beds in Pennsylvania. Despite its limited occurrence in the Ligonier Valley, this coal contributed much to the local economy but is now exhausted except for a few unmined pillars.

Conemaugh Group, Ccm

Rocks of the Conemaugh group are the most widely distributed in New Florence quadrangle, underlying most of the Ligonier Valley as a broad band, interrupted only where Blacklick Creek cuts down into older rocks. Conemaugh rocks also crop out in the Latrobe syncline and are preserved in patches on the north-plunging Chestnut Ridge anticline in the vicinity of Blacklick Creek.

The Conemaugh group, approximately 720 feet thick in this area, is composed dominantly of shale interbedded with fairly persistent sandstones, some clays, thin coals, and limestones, the latter usually being associated with red shales.

The Morgantown sandstone and the Ames and Brush Creek limestone may be identified and correlated reliably with equivalents of other areas because of distinctive lithology and/or stratigraphic position. The correlation of most members of the group, however, is only tentative.

Allegheny Group, Ca

The Allegheny group crops out in moderately-dipping bands on the flanks of Laurel Hill and Chestnut Ridge. To the north of the Conemaugh River, Allegheny rocks crop out extensively on the plunging crest of Chestnut Ridge. They also occur along Blacklick Creek.

The Allegheny group, earlier known as the Lower Productive Coal Measures, extends stratigraphically from the top of the Upper Freeport coal to the clay underlying the Brookville coal and has an average thickness of 330 feet in the quadrangle. The group is composed dominantly of shale and sandstone with valuable coals, fire clays, and limestones.

The Upper Freeport, Lower Freeport, and the Lower Kittanning are the most important coals and have been mined for many years. Large tonnages have been produced, but the reserves are considered to be large. The Upper Kittanning, Middle Kittanning, and Brookville coals have not been adequately explored, but the results of core drilling indicate that they may, locally at least, contain commercial reserves. The Allegheny coals commonly contain shale or bone partings and binders, and sulphur (pyrite and marcasite) in flakes and lenses. They are of medium-volatile bituminous rank, good steam coals, and have good coking properties. Available proximate analyses indicate the following ranges in composition: volatile matter 20 to 27.6 per cent, fixed carbon 59.9 to 70.9 per cent, ash 7.7 to 12.6 per cent, sulphur 1.04 to 4.31 per cent.

Upper Freeport coal, UF, normally 48 inches thick, is erratic in occurrence, due either to nondeposition or to deposition and subsequent erosion. The erosion surface, which generally exists at the contact of the roof shale and the overlying Mahoning sandstone, frequently extends into or through the coal bed. Such erosional unconformity is frequently well displayed in strip pits.

Upper Freeport coal has been mined underground and stripped in the northwestern part of the quadrangle, west of Coral, Black Lick, and Strangford. Core drilling east of the axis of the Latrobe syncline indicates the Upper Freeport to be of minable thickness. Several commercial mines were opened on the Upper Freeport on Blacklick Creek near Claghorn, but the coal could not be mined profitably due to irregularities in the thickness, in part the result of channelling ("faulting"). From records of numerous and well-distributed core drill holes, the Upper Freeport is presumed to be generally thin or missing in Brush Valley and East Wheatfield townships.

The Upper Freeport is of minable thickness along the Conemaugh River near Lockport, Robinson, and Bolivar, where several small mines are currently operating, but sandstone channels ("faults") have been reported. The known maximum thickness of this coal in the quadrangle is in the Lasalle mine just south of Bolivar, where it occurs in two benches, totaling up to 11 feet of coal, and is parted near the middle by approximately 18 inches of shale.

Unconfirmed reports of test drilling in the Ligonier Valley south from the Conemaugh River to West Fairfield and Rose Mountain Park indicate reserves of Upper Freeport coal may underlie a considerable area.

Lower Freeport coal, LF, occurring about 40 feet below the Upper Freeport, appears to be thin or missing in most of New Florence quadrangle. The best known development of this coal is in West Wheatfield and Burrell townships. It is presently being mined on a large scale about one mile south of Seanor, where it is from 40 to 54 inches thick. Lower Freeport coal has also been produced by strip mining north of U. S. Route 22 near Ridge School.

Lower Kittanning coal, LK, which lies about 185 feet below the Upper Freeport, is the most important coal in the Allegheny group in this area. The bed has a normal thickness of 30 to 40 inches, and not only excels in quality, but has a wide and uniform distribution.

The Lower Kittanning has been extensively mined for many years along Blacklick Creek, where it crops continuously from near Josephine eastward to the boundary of the quadrangle. A large scale mine is still active just west of Seanor. At present the largest production of Lower Kittanning in the quadrangle comes from the mines along the Conemaugh River at Seitz, Rotindale, and Robinson.

The Lower Kittanning is untested in large areas of the quadrangle, but, because of its persistent nature, some of these areas probably contain potential reserves of some magnitude.

Pottsville Series, Cpv

The Pottsville series is typically represented in the New Florence quadrangle by two sandstones separated by a variable amount of shale and clay which locally contains a thin coal, the whole averaging about 150 feet thick. These rocks are well exposed in the cut along the Pennsylvania Railroad west of Torrance.

The upper sandstone is the Homewood, which is massive, fine- to medium-grained, with a variable thickness of up to about 40 feet. The intervening shale and clay is the Mercer member, which is up to 30 feet thick. The lower sandstone, the Connoquenessing, occurs in one or more parts separated by shale. It is massive, hard, medium- to coarse-grained with pebbly lenses, and is generally about 30 feet thick.

Mississippian System

Mauch Chunk Group, Cmc

The Mauch Chunk is composed of alternating red and greenish argillaceous shales and interbedded greenish-gray, fine-grained, micaceous sandstone. The group has an average thickness of about 160 feet south of the Conemaugh River. As determined from the records of wells drilled for natural gas, the group is about 100 feet thick in the northeastern part of the quadrangle. In the northwestern part, no red beds are reported on the well records at the expected position of the Mauch Chunk, so it is probable that beds thin rapidly or become more sandy in that direction. The best exposure of the group in the quadrangle is along the Pennsylvania Railroad, north of Bolivar.

Loyalhanna Siliceous Limestone, Ll

The Loyalhanna siliceous limestone is massive, fine-grained, bluish to greenish-gray, has a flinty fracture, and is conspicuously cross-bedded. The observed thickness in this area ranges from 40 to nearly 70 feet. The Loyalhanna crops out on the flanks of Laurel Hill and Chestnut Ridge south from the Conemaugh River. Its contact with the Mauch Chunk serves as a valuable horizon in mapping the geology along the ridges.

Pocono Group, Cpo

The Pocono group is about 650 feet thick in the gorge of the Conemaugh through Chestnut Ridge, where the best exposures of the group in the quadrangle occur. It consists mainly of greenish-gray, fine-grained micaceous sandstones with interbedded sandy shales. Three coarse-grained to pebbly sandstones occur at 170, 185, and 480 feet from the top. A 10-foot sandstone, which typically develops a rusty, pitted appearance upon weathering, occurs near the top of the group and serves as a distinctive marker for the Pocono-Loyalhanna contact.

Rocks of the Pocono are also exposed on Laurel Hill, parts of Chestnut Ridge south of the Conemaugh River, and in the gorge of Blacklick Creek through Chestnut Ridge.

Upper Devonian Series

The Upper Devonian series crops out only in the Conemaugh gorge through Chestnut Ridge, where the Oswayo formation is exposed. About 330 feet of these rocks are above drainage, but only the topmost 140 feet, consisting of alternating gray to greenish-gray shales and sandstones, are exposed.

SUBSURFACE ROCKS

Information concerning the Devonian rocks has been obtained from wells drilled for gas. The Upper Devonian series is subdivided, in descending order, into the Oswayo formation (oldest rocks exposed within the quadrangle), Catskill red beds, Chemung facies, and Portage facies. The Catskill, predominately red shale with interbedded sandstones, is approximately 400 feet thick. The Chemung-Portage sequence consists of about 5300 feet of shales, limy shales, and sandstones. The "shallow" gas sands are in the Upper Devonian series. The top of the Tully limestone marks the base of the Upper Devonian.

The Tully limestone, a prominent subsurface key bed over much of the northern Allegheny Plateau, occurs at the top of the Middle Devonian series. The Tully is reported to be about 30 feet thick in two deep wells drilled in the quadrangle. Beneath the Tully is the Hamilton group, which consists of approximately 1475 feet of shale and limy shales. At the base of the series is the Onondaga formation, comprised of approximately 110 feet of limestone and chert. The Onondaga yielded a small amount of gas in one deep well in the New Florence quadrangle and is commercially productive a few miles to the south.

The Oriskany sandstone, principal objective of most deep gas exploration in Pennsylvania to date, lies at the top of the Lower Devonian series. In a recently completed unsuccessful test well, the Oriskany sandstone was reported to be 65 feet thick (Fettke, 1951).

MINERAL RESOURCES

Coal has proven the most important mineral resource of the New Florence quadrangle. The occurrence, distribution, and economic importance of the coal beds have already been discussed in their appropriate place under the stratigraphic description of the coal measures.

Natural Gas

The quadrangle has been explored for natural gas at various places, but production is limited to scattered "shallow sand" pools in the northern part of the area, particularly on the Nolo anticline. Known wells are shown by conventional symbols on the accompanying map.

Production has come from "shallow sands" of the Canadaway group, Upper Devonian series, at depths ranging from 3300 to more than 4400 feet. These lenticular sands, which range in thickness from about 10 to 100 feet, have not been sufficiently studied to permit correlation with the better known producing sands of this group to the west and north. Actual production figures are not available, but the average initial yield per well has been about 250,000 cubic feet per day, with some wells producing up to one million cubic feet per day.

Four deep test wells, all unsuccessful, have been drilled within the quadrangle, three on Chestnut Ridge and one on Laurel Hill. On Laurel Hill, in the southeast corner of the quadrangle, the Margaret Glass No. 1 well was abandoned in the Oriskany sand at 7726 feet, after having encountered a small flow of gas in the Onondaga and salt water in the Oriskany (Fettke, 1950, p. 106).

On Chestnut Ridge, in Derry Township, Peoples Natural Gas Company drilled Camilla F. Giffin wells 1 - 4, wells 1, 2, & 4 falling within the west boundary of New Florence quadrangle (Fettke, 1950, p. 105). The first well was abandoned in faulted Tully limestone; the second was abandoned due to faulting before reaching the Tully. Camilla Giffin No. 3, located west of the crest of Chestnut Ridge in Latrobe quadrangle, was abandoned in the Oriskany sand at 8174 feet, being dry in the Onondaga and Oriskany. The fourth well was completed as a dry hole in the Oriskany at 9200 feet, after penetrating what is interpreted as an overturned fold which repeated the Onondaga-Oriskany sequence three times (Fettke, 1951). These test wells have proven that the structure of the Chestnut Ridge anticline, relatively simple at the surface, becomes increasingly complex with depth.

Other Mineral Resources

In addition to coal and natural gas, New Florence quadrangle contains deposits of fire clay, sandstones, limestones, and minor iron ores.

The clay resources of the quadrangle are discussed in considerable detail by Leighton & Shaw (1932). Bolivar, along the Conemaugh River, near the center of the quadrangle, is the type locality of the well-known Bolivar flint clay, which was worked extensively in the past for use in refractory brick. The best of the Bolivar clay, which ranges from 3 to 12 feet thick, has been mined. Other clays, associated principally with the Allegheny group, occur in the area, but little is known of their distribution and quality.

Limestones present, particularly below some coal beds, are usually thin (4 feet or less) and impure, but they have been used locally for agricultural purposes. The siliceous Loyalhanna limestone, locally called "lime rock", crops extensively on the slopes of Laurel Hill and Chestnut Ridge. Crushed stone for railroad ballast and road metal has been produced in quantity from large quarries on the west side of Chestnut Ridge.

Sandstone is abundant and well distributed. The Pottsville sandstones have been used for rough masonry and as flagstone stone. The Homewood sandstone, locally quite pure, has not been investigated in this area as a possible source of glass sand.

Several iron furnaces, which operated using local ores for a short period during the Nineteenth Century, are still standing well-preserved in Ligonier Valley. The thin, scattered deposits of iron oxides and carbonate which supported these furnaces are too limited in extent and too low in grade to be worked profitably to supply the present-day, large-scale steel industry.

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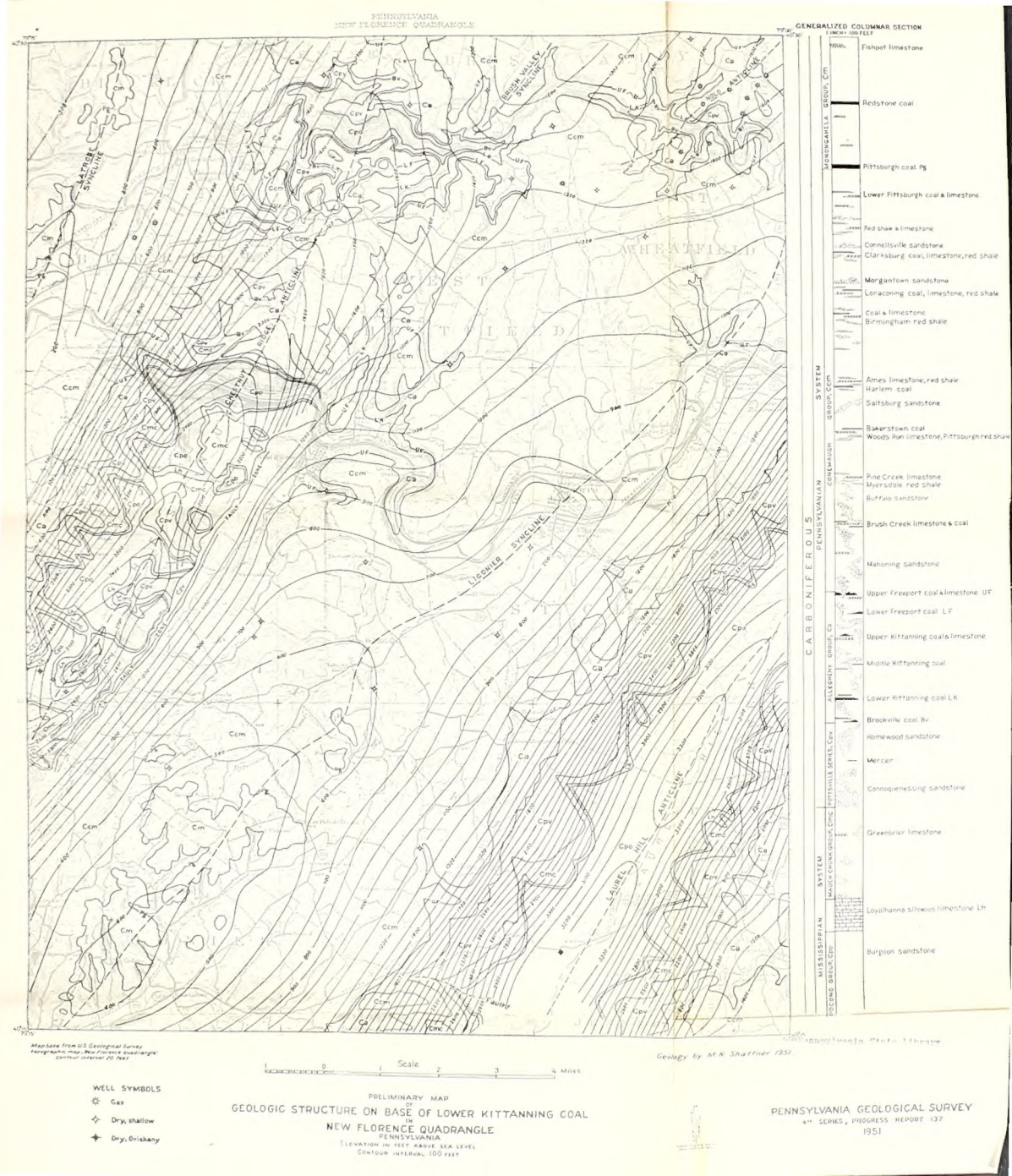

Map base from U.S. Geological Survey topographic map, New Florence quadrangle. Contour interval 20 feet

Geology by M.N. Shaffner 1951

Scale
1 0 1 2 3 4 Miles

WELL SYMBOLS
- Gas
- Dry, shallow
- Dry, Orishany

PRELIMINARY MAP
OF
GEOLOGIC STRUCTURE ON BASE OF LOWER KITTANNING COAL
IN
NEW FLORENCE QUADRANGLE
PENNSYLVANIA
ELEVATION IN FEET ABOVE SEA LEVEL
CONTOUR INTERVAL 100 FEET

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